REMARKS

I. Introduction

Claims 1-20, 22, 23, 26-29 and 38-42 are pending. Claims 11-17 and 20-22 have been amended. Claims 39-42 have been added. The pending claims 11-20, 22, 23, 26-29 and 38-42 are reproduced above.

Support for the amendment to claims 11-17 and 20-22 is found in column 2, lines 10-15 and lines 59-63 and column 3, lines 6-17 of U.S. Patent 5,552,949 ("the '949 patent"). These portions of the '949 patent show that the antiferromagnetic layer includes PtMn, where each of the Pt and Mn may be optionally substituted in part by other elements (i.e., N' and M'). Thus, the antiferromagnetic layer is properly claimed as an alloy of NM, where N comprises Pt and M comprises Mn. The term "on" in claim 11 has been changed to "adjacent", since an optional thin interface film may be present between the antiferromagnetic and ferromagnetic layers (see col. 4, lines 19-23 of the '949 patent).

New claim 39 is based on previously pending claim 11. New claim 40 corresponds to claim 11 that was previously pending.

New claims 41 and 42 generally correspond to claim 11 that was presented with the reissue declaration, but further recite that first ferromagnetic layer consists essentially of FeCo, as recited in column 4, line 8 of the '949 patent. No new matter was added.

II. The § 103(a) rejection should be withdrawn

In the Office Action, claims 11-20, 22, 23, 26-29 and 38 were rejected under 35 U.S.C § 103(a) as being unpatentable over Dieny et al. ("Dieny") in view of Lin et al. ("Lin"). This rejection is respectfully traversed.

A. Claims 11-20, 22, 23 and 38-40

Dieny discloses a SVMR element having a NiMn or FeMn antiferromagnetic layer. The Office Action asserts that the motivation for substituting the NiMn or FeMn antiferromagnetic layer of Dieny with a PtMn antiferromagnetic layer of Lin is that PtMn and NiMn have a similar Neel and blocking temperature, but PtMn provides an improved corrosion resistance.

However, neither Dieny nor Lin realized that the MR ratio in a spin valve magnetoresistance (SVMR) element is significantly improved by substituting the NiMn antiferromagnetic layer with PtMn layer. Thus, the addition of a PtMn alloy as the antiferromagnetic layer in a SVMR element provides an unexpected result which rebuts any prima facie case of obviousness that is allegedly established in the Office Action.

Applicants resubmit the Rule 1.132 Declaration of Mr. Hitoshi Iwasaki, one of the co-inventors of the present application. This Declaration was previously submitted in the parent application. As shown in the declaration, the use of a PtMn antiferromagnetic layer in a SVMR element significantly improves the MR ratio of the element compared to the NiMn or FeMn antiferromagnetic layers disclosed by Dieny.

For example, Mr. Iwasaki's Declaration shows that by using Dieny's NiMn and FeMn antiferromagnetic layers in a SVMR element provides an MR ratio of 3.7% and 3.9%, respectively. However, when the NiMn or FeMn layer in the identical SVMR element is substituted with a PtMn layer, the MR ratio dramatically increases to 7%. This result is not expected from the disclosure of Dieny or Lin. Therefore, the unexpected results presented in the Declaration are considered sufficient to overcome the § 103(a) rejection. A withdrawal of the rejection is respectfully requested.

B. Claims 26-29

Regarding claims 26-29, the Office Action implies that the exchange coupled film resulting from a combination of Dieny and Lin is inherently substantially free of corrosive pits. In order to establish a rejection based on inherency, the PTO must establish that the alleged inherent result must necessarily occur in the prior art product. MPEP 2112; *In re King*, 231 USPQ 136 (Fed. Cir. 1986); *Ex Parte Levy*, 17 USPQ2d 1461, 1464 (BPAI 1990). The Office Action has not established that the exchange coupled film resulting from a combination of Dieny and Lin must necessarily be substantially free of corrosive pits. Thus, a withdrawal of the rejection is respectfully requested.

C. Claims 41-42

Claims 41 and 42 recite that the first ferromagnetic layer consists essentially of FeCo. In contrast, Dieny does not teach using a FeCo ferromagnetic layer in the SVMR element (see col. 3, line 65 – col. 4, line 6 of Dieny for a list of ferromagnetic layers taught by Dieny). Applicants note that the claimed ferromagnetic layer which consists

essentially of FeCo excludes the NiFeCo ferromagnetic layer of Dieny. Lin provides no motivation for using a FeCo ferromagnetic layer in the SVMR element of Dieny.

Furthermore, as shown in Mr. Iwasaki's Declaration, when the FeCo ferromagnetic layers are used in combination with a PtMn antiferromagnetic layer, a large increase in the MR ratio of a SVMR element occurs compared to when NiMn or FeMn antiferromagnetic layers are used with the FeCo ferromagnetic layer. As discussed above, this result is clearly unexpected from the disclosures of Dieny or Lin.

III. Conclusion

In view of the foregoing, applicants respectfully submit that the pending claims are in condition for allowance. An early notice to this effect is earnestly solicited. Should there be any questions concerning this application, Examiner Miller is invited to contact the undersigned at the number listed below.

Respectfully submitted,

12/11/01
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Should additional fees be necessary in connection with the filing of this paper, or if a petition for extension of time is required for timely acceptance of same, the Commissioner is hereby authorized to charge Deposit Account No. 19-0741 for any such fees; and applicant(s) hereby petition for any needed extension of time.

prevent diffusion of spin valve film Co Fe

REDLINED VERSION OF CLAIMS TO SHOW CHANGES MADE

11. (Amended) A magnetoresistance effect element comprising:

a spin valve film [having] comprising a first ferromagnetic layer, a nonmagnetic layer, a second ferromagnetic layer, and an antiferromagnetic layer, wherein the nonmagnetic layer is provided between the first and second ferromagnetic layers, and the antiferromagnetic layer is provided [on] adjacent to the first or second ferromagnetic layer, the antiferromagnetic layer comprising an alloy of [PtMn] NM, where N comprises Pt and M comprises Mn.

12. (Amended) A magnetoresistance effect element as set forth in claim 11, wherein said NM alloy [is represented by] consists essentially of $Pt_{100-x}Mn_x$, where x is an atomic % number in the range of $24 \leq x \leq 75$.

13. (Amended) A magnetoresistance effect element as set forth in claim [11] 12, wherein said NM alloy [is represented by] consists essentially of $Pt_{100-x}Mn_x$, where x is an atomic % number in the range of $40 < x \leq 70$.

14. (Amended) A magnetoresistance effect element as set forth in claim [11] 12, wherein said alloy [is represented by] consists essentially of $Pt_{100-x}Mn_x$, where x is an atomic % number in the range of $24 \leq x \leq 35$.

15. (Amended) A magnetoresistance effect element as set forth in claim [12] 11, wherein [said alloy further] N comprises Pt and at least one element N′ selected from the group consisting of Fe, Co, Pd and Ni.

16. (Amended) A magnetoresistance effect element as set forth in claim 15, wherein said alloy has a ratio between Pt and N′ represented by $Pt_{100-y}N'_y$, where y is an atomic % number in the range of $0 < y < 30$.

17. (Amended) A magnetoresistance effect element as set forth in claim 11,

wherein said NM alloy has a tetragonal crystalline structure.

18. A magnetoresistance effect element as set forth in claim 11, wherein the first ferromagnetic layer comprises a metal selected from the group consisting of Fe, Ni, Co, FeNi, FeCo, FeCoNi, and an alloy thereof.

19. A magnetoresistance effect element as set forth in claim 11, wherein the antiferromagnetic layer has a film thickness larger than that of the first ferromagnetic layer.

20. (Amended) A magnetoresistance effect element as set forth in claim 11, wherein said [alloy further] M comprises Mn and at least one element M′ selected from the group consisting of transition metals, rare earth metals, and half metals.

22. (Amended) A magnetoresistance effect element as set forth in claim 11, wherein [PtMn is represented by] said NM alloy consists essentially of $Pt_{100-x}Mn_x$, where x is an atomic % number in the range of $40 < x \leq 75$.

23. A magnetoresistance effect element as set forth in claim 16, wherein y is an atomic % number in the range of $1 \leq y \leq 10$.

26. A magnetoresistance effect element, comprising

an exchange coupled film having a first ferromagnetic layer and an antiferromagnetic layer, the antiferromagnetic layer being on the first ferromagnetic layer, and the exchange coupled film being substantially free of corrosive pits, when the exchange film is exposed to an atmosphere having a relative humidity of 90%, at a temperature of 90 degrees centigrade for a time duration of 48 hours.

27. A magnetoresistance effect element as set forth in claim 26, wherein the exchange coupled film has less than a 10% probability for occurrence of corrosive pits.

28. A magnetoresistance effect element as set forth in claim 26 wherein the

antiferromagnetic layer comprises an alloy of NMn, where N is at least one element selected from the group consisting of Cu, Ru, Rh, Re, Pd, Pt, Ag, Au, Os, and Ir.

38. A magnetic head comprising a magnetoresistance effect element as set forth in claim 11.

39. A magnetoresistance effect element as set forth in claim 11, wherein the antiferromagnetic layer is provided on the ferromagnetic layer.

40. (New) A magnetoresistance effect element comprising:

a spin valve film having a first ferromagnetic layer, a nonmagnetic layer, a second ferromagnetic layer, and an antiferromagnetic layer, wherein the nonmagnetic layer is provided between the first and second ferromagnetic layers, and the antiferromagnetic layer is provided on the first or second ferromagnetic layer, the antiferromagnetic layer comprising an alloy of PtMn.

41. (New) An exchange coupling film comprising:

an antiferromagnetic layer comprising an alloy of NM, where N comprises Pt and M comprises Mn, said antiferromagnetic layer having a tetragonal crystalline structure, and a first ferromagnetic layer consisting essentially of FeCo.

42. (New) A magnetoresistance effect element comprising a spin valve film including the exchange coupling film of claim 41.